Future of Airfield Damage Assessment

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A top priority following an enemy attack is expeditiously recovering the airfield. Presently, airfield damage assessment teams, on foot or in vehicles, survey the damage and prioritize repairs — a lengthy procedure that may also expose team members to a hostile environment.

In 2008, a Joint service program called CRATR (Critical Runway AssessmenT and Repair) was launched to modernize airfield recovery by investigating solutions in technology; material; and tactics, techniques, and procedures. Thus far, CRATR has focused on two phases of recovery: damage assessment and crater repair.

The Rapid Airfield Damage Assessment System (RADAS) is an effort to help prioritize repairs by rapidly selecting the best minimum airfield operating surface (MAOS). Development engineers are turning to continuous advances in remote sensing technology such as unmanned systems, sensors, image processing algorithms, and geographic information systems (GIS) to equip the RADAS.

RADAS design faces some challenges: surveying a large surface area with high resolution to detect small targets; adequate mapping accuracy; and capability in a variety of environmental conditions. It must be user-friendly, small and economical enough to equip many bases, and reliable for use in contingencies. Finally, RADAS must perform its end-to-end assessment with MAOS selection within 30 minutes.

The requirements list and rapid technology fielding motivation have shaped the RADAS into a system of systems. Its data acquisition system is a result of the proliferation of unmanned aerial systems in DOD. A small, tactical, runway-independent, remotely piloted aircraft of less than 80 pounds is rapidly launched on a preplanned survey path. Its sensor suite consists of the latest turreted camera system with electro-optical and infrared imagers for day, night, and reduced visibility conditions. Other types of sensors, such as Light Detection and Ranging and Synthetic Aperture Radar are being investigated as their technologies miniaturize and resolution capabilities increase.

RADAS imagery is transmitted in near-real time to its data processing system located in a ground control station. Innovative processes paste captured image frames into a mosaic of the pavement before geographically registering it to a baseline image. Challenges exist to perform accurate georegistration with the narrow field-of-view of the electro-optical or infrared imagery. Novel image-processing algorithms and user interfaces aid extraction of damage items from the image. The objective is for a single operator to view imagery of all pavement areas and declare hundreds of damaged items rapidly and reliably.

Finally, RADAS is leveraging existing Civil Engineering GIS tools (e.g., Geospatial Expeditionary Planning Tool) to expedite and improve MAOS selection. Populating a digital map of the airfield with identified damage items allows an operator to interactively designate the MAOS using least-cost-routing and damage repair time estimation algorithms. A file with coordinates of the MAOS and prioritized damage repairs is then passed on to explosive ordnance disposal and crater repair teams. Before the RADAS can become operational, some bigger items will need to be fully addressed; ownership and manning within different career fields, integration with current airfield operations, supportability, and overall doctrinal changes within recovery operations.

During testing in August 2009 at Avon Park AFR, Fla., the RADAS was able to perform a night-time, end-to-end assessment of more than 110 craters over the entire airfield and produce a MAOS in less than 26 minutes, a considerable improvement over previous results. Testing for the next prototype iteration is scheduled for July 2010.

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Mr. Mike Busutil (left) and Mr. Stephen Dixon from the NAVAIR UAS Deployment Team navigate the RADAS system to rapidly assess airfield damage from their ground control station. (photo by Mr. Oscar Reihsmann)